REMARKS

Claims 1-8 are now pending in the application. No amendments have been made herein. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Vasileiadis et al. (U.S. Pat. No. 6,919,062; "Vasileiadis") in view of Kato et al. (U.S. Pat. Pub. No. 2004/0157099; "Kato") and further in view of Edlund et al. (U.S. Pat. Pub. No. 2003/0159354; "Edlund"). This rejection is respectfully traversed.

Applicant submits that the cited prior art references do not render obvious claim 1 because the references fail to teach or suggest a "fuel cell system . . . comprising: a fuel cell stack including a plurality of proton exchange membranes . . . and a plurality of coolant passages extending between adjacent ones of said plurality of proton exchange membranes; and a conduit in fluid communication with said coolant passages . . . and comprising a first layer of hydrogen-permeable material," as recited in claim 1.

Vasileiadis discloses feed gases and steam flowing through a permreactor-separator, yielding a hydrogen-based gas that can be supplied to an anode side of a fuel cell stack (Abstract, Fig. 11). Vasileiadis further discloses the permreactor-separator comprising a hydrogen permeable tube (col. 3, line 63 – col. 4, line 9). As the Examiner acknowledges, Vasileiadis does not disclose coolant passages passing between the membranes of the fuel cell. In addition, Vasileiadis does not disclose the hydrogen permeable tube in fluid communication with coolant passages.

Kato discloses coolant passages 32a, 32b between membrane electrode assemblies 22 in a fuel cell 12 (fig. 2). The Examiner asserts that it would have been obvious to employ the cooling arrangement of Kato in the fuel cell of Vasileiadis in order to control stack temperature and reactivity between the cells. However, Kato does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages and comprising a first layer of hydrogen-permeable material, as claimed.

Edlund discloses a steam reformer 12 that separates a hydrogen stream from a vapor feedstock to provide hydrogen to a fuel cell 16 and that includes a membrane tube 54 (paragraph [0033], lines 4-5; paragraph [0034], lines 1-11; paragraph [0040], lines 1-7; figs. 1 and 2). Edlund further discloses that the membrane tube 54 may be composed of hydrogen-permeable materials (paragraph [0043], lines 4-7). The Examiner cites Edlund for teaching hydrogen-permeable tubes in fuel cell stacks. However, Edlund discloses that the membrane tube 54 is located in the steam reformer 12, not in the fuel cell 16 (fig. 3). Moreover, Edlund does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages and comprising a first layer of hydrogen-permeable material, as claimed.

Thus, none of the references teach or suggest a conduit in fluid communication with coolant passages and comprising a first layer of hydrogen-permeable material, as claimed. The Examiner acknowledges that Vasileiadis does not expressly disclose the fuel cell stack in heat transfer communication with the feed gases, which the Examiner refers to as cooling fluid. However, the Examiner asserts that it would have been obvious to one skilled in the art to employ the fuel cell stack in heat transfer communication with the feed gases in order to control the stack temperature.

Applicant submits that the Examiner has not established a prima facie case of obviousness regarding a hydrogen-permeable conduit in fluid communication with coolant passages. "[R]ejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." MPEP2142, citing *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

As discussed above, Vasileiadis and Edlund disclose passing steam and feed gases through a hydrogen-permeable tube to separate hydrogen for use in a fuel cell. Edlund also discloses that elevated temperatures are needed for steam reforming within the reformer 12 (paragraph [0035], lines 10-15). Thus, it would not have been obvious to place the hydrogen-permeable tubes of Vasileiadis or Edlund in fluid communication with coolant passages in order to control the stack temperature, as the gases passing through the hydrogen-permeable tubes would increase the stack temperature.

Moreover, Applicant notes that claim 2 recites the "fuel cell system of claim 1 further comprising a support layer" and claim 3 recites the "support layer is breathable to enable passage of said hydrogen to atmosphere." Vasileiadis discloses a far outer impermeable tube/shell (7) that prevents passage of hydrogen to atmosphere (fig. 1). As the Examiner acknowledges, Vasileiadis does not disclose the claimed support layer that is breathable to enable passage of hydrogen to atmosphere.

The Examiner asserts that it would have been obvious to employ the hydrogen permeable tube of Edlund in the fuel cell of Vasileidis in order to separate products in a vicinity of the membrane tube. Applicant understands the Examiner as indicating that it

would have been obvious to modify the fuel cell of Vasileidis to include the hydrogen-permeable support layer of claims 2 and 3 in view of Edlund.

As noted above, Edlund discloses that the membrane tube 54 is located in the steam reformer 12, not in the fuel cell 16. In addition, Edlund discloses that the membrane tube 54 is surrounded by an inner metal tube 52, which is surrounded by an outermost metal tube 50 (paragraph [0040], lines 2-5; fig. 2). Edlund also discloses that hydrogen is produced in a reforming region within the inner metal tube 52 in a vicinity outside of the membrane tube 54 (paragraph [0043], lines 1-4; fig. 3). Edlund further discloses that some hydrogen passes through the membrane tube 54, and a remaining portion of the hydrogen is combusted in a combustion region between the inner metal tube 52 and the outermost metal tube 50 (paragraph [0035], lines 1-15; fig. 3).

Edlund does not teach or suggest the hydrogen-permeable support layer of claims 2 and 3 for two reasons. First, Edlund teaches passing hydrogen through the membrane tube 54 from outside of the membrane tube 54. Edlund does not teach passing hydrogen through the membrane tube 54 from within the membrane tube 54. Second, Edlund teaches passing hydrogen through an opening of the inner metal tube 52 to be combusted in the combustion region outside of the inner metal tube 52. Edlund does not teach passing hydrogen through the membrane tube 54 or through the inner metal tube 52 to the atmosphere.

Furthermore, Applicant reiterates that any modification of the permreactor-separator of Vasileiadis to include a support layer that is breathable to enable passage of hydrogen to the atmosphere would render the permreactor-separator of Vasileiadis unsatisfactory for its intended purpose of capturing hydrogen for use in a fuel cell.

Accordingly, the prior art fails to teach or suggest all of the limitations of claims 1 and 3. In addition, claims 2-8 depend from claim 1 and should be patentable for the reasons set forth above supporting the patentability of claim 1. Therefore, reconsideration and withdrawal of the rejection of claims 1-8 are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: April 30, 2009

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